Prince George Forest Region

Forest Resources & Practices Team

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FOREST RESEARCH NOTE

Use of Wildlife Tree Patches by Forest Birds in the Sub-Boreal Spruce (SBS) Zone

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Wildlife Tree Patches retained in clearcuts, and mature forest patches within young forest stands, provide valuable habitat for many forest bird species.

INTRODUCTION

Many wildlife species are dependent on habitat attributes within forest stands such as large live trees, standing dead trees, fallen logs, and understory shrubs. Standing dead trees (snags) are especially important because they are used by many species, such as bats, woodpeckers, and furbearers, for feeding and/or nesting. Forest harvesting and silvicultural practices can eliminate or significantly reduce many important habitat attributes. Consequently, management practices that maintain important habitat attributes within forest stands are an important component of conserving biological diversity in managed forests.

Wildlife tree patches retained within a cutblock in the Hominka Valley

The Forest Practices Code Biodiversity Guidebook recommends various management practices to maintain habitat attributes within managed stands. The most important of those is the retention of unharvested patches of forest called Wildlife Tree Patches (WTP's) on all cutblocks. The unharvested patches are intended to provide habitat attributes within cutblocks, and in the forests that later regenerate on those sites.

Retaining unharvested patches provides several advantages over the alternative approach of trying to keep habitat attributes distributed across a cutblock. It is not acceptable to leave snags within harvested areas because they are a safety risk to forest workers. Snags can however be safely left within unharvested patches. Thus, retaining patches is the only way that existing snags can be left on cutblocks. In addition to maintaining existing snags, unharvested patches will also retain some large trees on the cutblock. Some of those trees will die during the subsequent rotation period and provide a source of new large diameter snags. Unharvested patches will also provide an undisturbed remnant of forest floor and understory plants that can serve as a refuge for species until the ecological conditions of the regenerating cutblock are suitable for those species to become re-established.

Retaining unharvested patches is also consistent with the natural disturbance ecology of boreal and subboreal forests. These forests historically experienced large wildfires at fairly frequent intervals, but fires did not destroy all of the forest in their path. Wildfires usually skip some areas, resulting in scattered patches of unburned forest that comprise 5-15% of the burned area. Those unburned patches provide a source of mature forest habitat attributes within the burn, and within the young forest that regenerates on that site.

Although WTP's in new cutblocks may provide immediate habitat values, the primary reason for retaining WTP's is to provide mature forest habitat attributes within the regenerated forest throughout the subsequent rotation period. Consequently, WTP's are to be retained within the stand until at least the next rotation period. At that time, WTP's may be left for another rotation, or they can be harvested and replaced with different WTP's within the new cutblock.

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We were interested in evaluating bird use of mature forest patches both within new cutblocks, and also within regenerated, young forests. Because WTP's are now being left in cutblocks it was possible to directly evaluate their use by forest birds. To evaluate bird use of mature forest patches within regenerating forests, we sampled mature forest patches that were naturally present within 40-60 year old stands that had regenerated after wildfires.

The objectives of this research note are:

i) to evaluate bird use of mature forest patches that have been retained within cutblocks, and

ii) to evaluate bird use of mature forest patches within 40-60 year old forests that originated after natural wildfires.

STUDY AREAS

The studies were conducted in two different portions of the SBS zone within the Prince George Forest District. Bird use of WTP's within cutblocks was studied in the Hominka Valley, and also in 3 different watersheds on the Nechako Lowland surrounding Prince George. In the Hominka Valley, 9 WTP's were sampled in cutblocks on the lower slopes of steep, mountainous terrain in the wet SBSvk subzone which the Biodiversity Guidebook classifies as Natural Disturbance Type 2 (NDT2). On the Nechako Lowland a total of 10 WTP's were sampled (3 in the Salmon River area, 3 in the Gregg Creek area, 4 in the Stone Creek area) within cutblocks on flat to rolling terrain in the drier SBSmk1 and SBSdw3 subzones which are in NDT3. WTP's consisted of either peninsulas of mature forest extending into clearcuts, corridors of mature forest extending completely across a clearcut, or islands of mature forest surrounded by clearcut. All the patches in the Hominka had been purposely left as WTP's, whereas some of the patches on the Nechako Lowland were left due to timber type or operational constraints.

WTP's ranged in size from 0.5 to 10.2 hectares in size. All clearcuts were less than 10 years in age from time of harvest. The WTP's in the Hominka Valley were primarily hybrid spruce (*Picea engelmannii* X *glauca*) and subalpine fir (*Abies lasiocarpa*), whereas the WTP's on the Nechako Lowland were dominated by either lodgepole pine (*Pinus contorta*), black spruce (*Picea mariana*) or Douglas-fir (*Pseudotsuga menziesii*).

Bird use of mature forest patches within young fire-origin stands was studied in the SBSmk1 subzone in the Salmon River area. Mature patches ranged from 0.2 to 14.4 hectares in size and were located in young fire-origin stands that were several thousand hectares in size. The fire-origin forests surrounding the patches ranged in age from 40 to 70 years since disturbance. Comparative data were collected from contiguous old forests (>140 years) in the same area. The young fire-origin stands were primarily lodgepole pine whereas the mature forest patches contained a variety of tree species including lodgepole pine, hybrid spruce, subalpine fir, Douglas-fir, and trembling aspen (*Populus tremuloides*).

METHODS

Evaluating Bird Use of WTP's in Clearcuts

For each WTP, a census point was located near the centre of the patch, another in the clearcut outside the patch, and a third in contiguous mature forest adjacent to the clearcut. To reduce "edge effects", census points in clearcuts were located at least 150 metres from forest, and mature forest points were located at least 150 metres from the edge of the clearcut.

Birds were censused during 5 replicate counts at each census point. Replicate counts were distributed throughout the 1996 breeding season from May 21 to June 26. All birds seen or heard within 75 metres of each census point during an 8 minute period were recorded by experienced bird researchers. All counts were conducted between 0500 hrs and 0830 hrs. The 2 observers alternated the replicate counts for each census point to reduce any observer bias, and also alternated the order of sampling each morning to reduce any bias associated with the time of day.

Data for the Hominka Valley (NDT2) and the Nechako Lowland (NDT3) were analysed separately. Within the two different areas, the total number of detections of each species were lumped together for the 5 replicate counts and for all points in similar habitat (ie. WTP's, clearcuts, mature forests). Thus, the total number of counts within each habitat type was 45 in the Hominka Valley, and 50 for the Nechako Lowland. Differences between habitat types were compared using a Chi-square test and considered significant at $p < 0.05$. Bird species with less than 10 detections were not included in the analyses. Due to low detection rates and difficulty in distinguishing species by sound alone, woodpeckers (excluding Northern Flickers) were analysed as a group. Flickers were excluded because they prefer clearcuts, whereas the other woodpecker species prefer forests. Relationships between the detection rates of forest-dwelling birds and various characteristics of the patches, including patch size and distance to contiguous forest, were evaluated by regression analyses.

Evaluating Bird use of Mature Forest Patches in Fire-origin Stands

Bird use of mature forest patches within fire-origin stands was studied during the summers of 1995 and 1996, and is ongoing. A total of 8 census points within patches were sampled in 1995, and an additional 8 were added in 1996 for a total of 16. In 1995, 16 census points were established in young forests surrounding the patches, at least 200 metres away from the patch. An additional 16 patches were established in young forest in 1996 for a total of 32. In 1996, 20 census points were established in contiguous stands of old forest in the same geographic area.

Each year, birds were censused during 4 replicate counts at each point, except for 4 points during 1996 that only had 3 replicate counts. Replicate counts occurred between May 28 and July 16, and were conducted between 0500 and 0830 hrs. All birds seen or heard within 75 metres of each census point were recorded during 8 minute counts. Replicate counts at each point were alternated between 2 observers, as was the order of sampling, to reduce any bias due to observers or time of day.

The total number of detections of each species at all points and all replicate counts for both years were lumped together for each habitat type (ie. patch, young forest, old forest). Due to differences in the total number of counts in each habitat type, data for each habitat type were standardized to number of detections/80 counts. Differences between habitat types were compared with a Chi-square test and considered significant at $p<0.05$. Species with less than 10 detections were not included in the analyses and detections of all woodpecker species were lumped together for analysis.

Although the methodology for the two studies was similar, there were sufficient differences that we do not directly compare detection rates between the two studies.

RESULTS

Bird Use of WTP's in Clearcuts

Hominka Valley (NDT2)

In the Hominka Valley, a total of 36 different species of birds were detected within WTP's, 26 species in contiguous forest, and 22 species in clearcuts. The average number of species detected (Species Richness) at each point was similar in WTP's and contiguous forest, but less in clearcuts (Figure 1).

For the 17 species that provided at least 10 detections (Table 1), 2 were more abundant in contiguous forest than in patches, however, those two species were

FIGURE 1. Average number of bird species detected (Species Richness) at census points in the Hominka Valley.

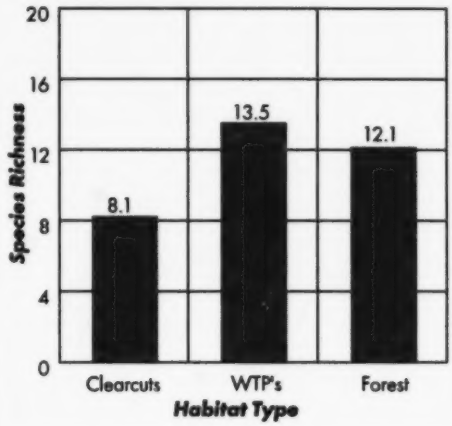

TABLE 1. Number of detections of birds during point counts (detections/45 point counts) in the Hominka Valley. (Only species that were detected at least 10 times).

	Clearcut	WTP	Forest
Most abundant in Forest			
Townsend's warbler	1	9	25
Magnolia warbler	0	4	13
Most abundant in Forest and WTP's			
Golden-crowned kinglet	0	45[a]	58[a]
Winter wren	3	34[a]	38[a]
Wilson's warbler	7	39[a]	24[a]
Hammond's flycatcher	0	15[a]	7[a]
Red-breasted nuthatch	0	8[a]	6[a]
Varied thrush	0	8[a]	6[a]
Most abundant in WTP's			
Yellow-rumped warbler	6[a]	28	9[a]
Ruby-crowned kinglet	0[a]	11	3[a]
Most abundant in WTP's and Clearcuts			
Chipping sparrow	23[a]	13[a]	3
American Robin	13[a]	9[ab]	3[b]
Most abundant in Clearcuts			
Dark-eyed junco	83	12[a]	12[a]
Lincoln's sparrow	49	3[a]	0[a]
MacGillivray's warbler	22	9[a]	7[a]
Equal abundance in all types			
Stellar's Jay	8[a]	7[a]	11[a]
Western Tanager	1[a]	5[a]	5[a]

[ab]/ For each species, values with the same superscript are not significantly different from each other ($p>0.05$)

FIGURE 2. Average number of bird species detected (Species Richness) at census points on the Nechako Lowlands.

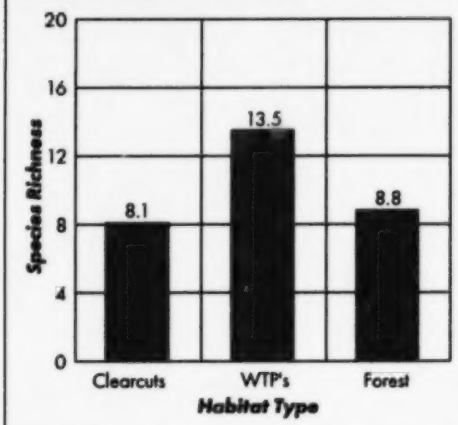

TABLE 2. Number of detections of birds during point counts (detections/50 point counts) on the Nechako Lowland. (Only species that were detected at least 10 times)

	Clearcut	WTP	Forest
Most abundant if Forest			
Golden-crowned kinglet	0	20	54
Most abundant in Forest and WTP's			
Yellow-rumped warbler	4	31[a]	29[a]
Hammond's flycatcher	0	28[a]	18[a]
Ruby-crowned kinglet	0	28[a]	16[a]
Red-breasted nuthatch	0	8[a]	15[a]
Swainson's thrush	0	14[a]	7[a]
Winter wren	0	5[a]	7[a]
Woodpeckers	1[a]	9[b]	4[ab]
Most abundant in WTP's			
Wilson's warbler	1[a]	16	0[a]
Townsend's warbler	0[a]	11	1[a]
American redstart	0[a]	11	0[a]
Warbling vireo	0[a]	10	1[a]
Most abundant in WTP's and Clearcuts			
American robin	19[a]	26[a]	3
Chipping sparrow	7[a]	9[a]	1
Dusky flycatcher	10[a]	4[a]	0
Song sparrow	6[a]	5[a]	0
Most abundant in Clearcuts			
Dark-eyed junco	66	12[a]	10[a]
Lincoln's sparrow	34	1[a]	0[a]

[a,b]/ For each species, values with the same superscript are not significantly different from each other (p>0.05).

more abundant in patches than in clearcuts. Six species were equally abundant in contiguous forest and WTP's, but absent or much less abundant in clearcuts. Two species were more abundant in WTP's than in forest or clearcuts. Two species were most abundant in WTP's and clearcuts, 3 were most abundant in clearcuts, and 2 were equally abundant in all habitat types. Thus, 10 of the 17 species were more abundant in WTP's than in clearcuts and 6 of those species were never detected in clearcuts.

Regression analyses found no significant relationships ($p>0.05$) between the detection rate of forest dwelling birds within WTP's, and size of the patch or distance to contiguous forest.

Nechako Lowlands (NDT3)

On the Nechako Lowlands, a total of 39 different species of birds were detected within WTP's, 29 species in contiguous forest, and 29 in clearcuts. The average number of species detected (Species Richness) at each point was greater in WTP's than in contiguous forests or clearcuts (Figure 2).

For the 18 species (including woodpeckers as a group) that provided at least 10 detections (Table 2), only Golden-crowned kinglets were more abundant in contiguous forest than in WTP's. However, this species was more abundant in WTP's than in clearcuts. Seven species were equally abundant in contiguous forest and WTP's, but absent or much less abundant in clearcuts. Four species were more abundant in WTP's than in either forest or clearcuts. Four species were most abundant in WTP's and clearcuts, and 2 were most abundant in clearcuts. Thus, 12 of the 18 species were more abundant in WTP's than in clearcuts and 9 of those species were never detected in clearcuts.

Regression analyses found no significant relationships ($p>0.05$) between the detection rate of forest dwelling birds within WTP's, and size of the patch or distance to contiguous forest.

Bird Use of Old Forest Patches Within Young Forests

The average number of species detected at each census point was greatest in contiguous old forest, intermediate in patches and lowest within the young forest (Figure 3).

For the 20 species (including woodpeckers as a group) that provided at least 10 detections (Table 3), 8 were most abundant in contiguous old forest, and 4 of those species were more abundant in patches than in young forest. Three species were equally abundant in

contiguous old forest and old forest patches, but less abundant in young forest. Four species were detected most frequently in patches. One species was most abundant in young and old forest, one in young forest, and 3 species were equally abundant in all habitat types. Overall, 10 of the 20 species were more abundant in patches than in young forest.

DISCUSSION

In both the Hominka Valley and the Nechako Lowland, WTP's within clearcuts were used by forest-dwelling birds. For most of those species, detection rates were similar between contiguous forests and WTP's. For several species, the detection rate was higher in WTP's than in contiguous forest or clearcuts which suggests that some species actually prefer small patches and/or forest edge. Most forest-dwelling species that used WTP's were totally absent from, or significantly less abundant in clearcuts. Species associated with clearcuts also used WTP's, although several species were significantly less abundant in WTP's compared to clearcuts.

Our inability to detect any relationships between forest bird abundance, and the size and isolation of WTP's, was probably in part due to the small sample size. Nonetheless, it does indicate that even the very smallest and isolated WTP's provided habitat for forest birds. Within our 3 smallest WTP's of 0.5 - 0.7 ha, we had detections of 7 to 20 different bird species, similar to detection rates in much larger patches.

These results indicate that WTP's retained within clearcuts are extensively used by forest birds. Although detection rates alone may not properly reflect the ecological values of WTP's compared to contiguous forest, it is clear that retention of WTP's provided habitat for forest birds that was not provided by clearcuts.

The presence of patches of old forest within younger forest stands also appeared to provide useful habitat for birds. Many bird species were more abundant in those patches of old forest than in the surrounding 40-70 year old forests. Although some species were more abundant in contiguous old forest than in patches, others were equally or more abundant in patches than in contiguous old forest. Only one species was most abundant in young forest. These results indicate that the presence of patches of old forest within young forest stands significantly increases the value of those stands as habitat for many forest bird species.

Figure 3. Average number of bird species detected (Species Richness) at census points.

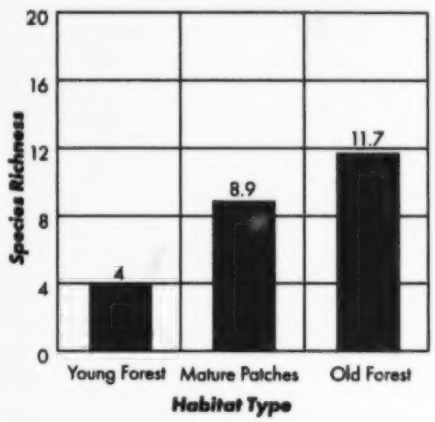

TABLE 3. Number of detections of birds during point counts (detections/80 point counts) in Salmon River area.(Only species that were detected at least 10 times).

	contiguous young forest	old forest patches in young forest	contiguous old forest
Most abundant in contiguous old forest			
Swainson's thrush	14	28	46
Winter wren	0	11	46
Magnolia warbler	3	17	41
Red-breasted nuthatch	2	10	21
Hammond's flycatcher	2[a]	8[a]	21
Western tanager	1[a]	3[a]	17
Wilson's warbler	1[a]	0[a]	14
Varied thrush	1[a]	2[a]	9
Most abundant in old patches and contiguous forest			
Golden-crowned kinglet	6	43[a]	45[a]
American robin	1	6[a]	13[a]
Woodpeckers	3	13[a]	16[a]
Most abundant in patches			
Ruby-crowned kinglet	3	32	15
Dark-eyed junco	16[a]	30[b]	23[ab]
Orange-crowned warbler	3[ab]	10[a]	2[b]
Gray jay	2[a]	10[b]	3[ab]
Most abundant in young and old forest			
Yellow-rumped warbler	32[a]	16	31[a]
Most abundant in young forest			
Hermit thrush	19	3[a]	0[a]
Equal abundance in all types			
Pine siskin	15[a]	19[a]	17[a]
Solitary vireo	7[a]	2[a]	8[a]
Blackpoll warbler	6[a]	9[a]	4[a]

[ab]/ for each bird species, values with the same superscript are not significantly different from each other ($p>0.05$)

SUMMARY

1. Many forest bird species were more abundant in Wildlife Tree Patches than in the surrounding clearcut.

2. Many forest bird species were more abundant in patches of old forest within 40-70 year old stands, than in the surrounding younger forest.

3. Retaining Wildlife Tree Patches in cutblocks, and maintaining them throughout the forest rotation, increases the value of managed stands as habitat for many forest bird species.

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A naturally occurring mature forest patch within young, fire-origin forest.

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